Amended specification, page 12, starting at line 27

The literature on the generation of sounds of instruments with continuous sound emission, among which aerophone instruments, by means of the physical modeling technique, proposes solutions based on a mutual interaction between a non-linear active part, normally defined as excitation (55), and a linear passive part, defined as resonator (56), according to the scheme of Fig. 17. ~~The method exposed in US patent 5,521,328 can be considered as an example of this technique.~~ In the case of aerophone instruments, the energy contributed to the system is in the form or sound pressure and the signal produced is the progression of the sound pressure wave irradiated by one or more suitable points of the resonator. The waveform (p(t) is the progression of the air pressure that the performer (or the bellows, in the case of a church organ) exercises on the instrument mouthpiece. According to this progression and to the progression of the pressure w(t) in a suitable point inside the resonator, an oscillating acoustic pressure e(t) injected in the resonator is generated. Once the sustain phase has been reached, the pressure e(t) has the same fundamental frequency as the pressure w(t). Being linear (except for very special operation modes), the resonator can be described with an impulse response r(t), which generates the return signal w(t) and an impulse response h(t), which generates the output signal y(t). The latter is the time progression of the sound emission of the instrument. Being it a numerical simulation performed in the time domain instead of the frequency domain, the fundamental frequency of the oscillation on which the system stabilises, once the sustain phase has been reached, is extremely difficult to predict mathematically. This depends on the fact that the frequency depends on the time progression of the forcing signal a(t), and not only on the frequency values in which the amplitude spectrum of the impulse response of the resonator has the relative

maximum values. In fact, any type of harmonic oscillator (electronic, mechanical, etc.) has this characteristic. With regard to wind instruments (including organ pipes), it is sufficient, for example, to increase the sound pressure to obtain an increase of the fundamental frequency of the acoustic wave, in addition to an intensity increase, although the characteristics of the resonant part remain unchanged.

Amended specification, page 14 beginning line 24

The preparation of the numerical parameters of any oscillating system, as generically illustrated in Fig. 17, requires special sensitivity an skill, apart from the perfect knowledge of its mathematical model. This means that the good operation of the system may be impaired, and the system may become unstable or even inharmonious, if only one of the parameters has a value not included in a proper range. Moreover, different operational modes of the oscillator can be obtained only by acting simultaneously and with special attention on a plurality of parameters, with the risk of making the time evolution of one or more signals in transit along the functional blocks of the system uncontrollable. This makes the search for multiple sounds produced by this type of synthesis slow and difficult. On the contrary, a system with no feedback between resonator and excitation, such as the system shown in Fig. 2, enables to modify the numerical parameters of the three functional blocks (9), (11), (12) in a completely independent way, without impairing the good operation of the system as a whole. This allows obtaining a larger variety of sounds than the one obtained by means of a feedback loop system with equal complexity.

~~The current literature proposes, as e.g. in US patent 5,587,548, an alternative technique which is known as commuted synthesis, based on excitation wavetables and resonant filters, being the latter used to simulate the acoustical behaviour of an instrument's linear and passive part, in such a case, with an adequate sampled sound's analysis and optimization, a good compromise is found between the necessary amount of memory for the wavetables and the necessary computational power to implement the physical - mathematical algorithm which corresponds to the instrument's resonant parts.~~

The system of Fig. 3 shows a sequence of operations performed on the signal produced by the sinusoidal oscillator (14). The type and order of the operations are only one of the possible realisations used to generate a waveform sufficiently rich in harmonic components and provided with a suitable time evolution, in any case, some of the functional blocks of the system, such as the delay (24) and the non-linear function (26), derive from mathematical models of wind instruments known in the literature, without the need of using them. <u>The originality of the system mainly consists in the adaptation of an ordinary oscillator with status variables for non-stationary operational conditioning by developing the functional blocks (30) and (32) of Fig. 4, in order to make the oscillator robust to the variations of the parameter F^2 of the block (29).</u>